

CLAIMS:

1. An isolated nucleic acid molecule comprising a sequence of nucleotides encoding a flavonoid 3'-hydroxylase or a derivative thereof wherein said flavonoid 3'-hydroxylase or its derivative is capable of more efficient modulation of hydroxylation of flavonoid compounds in plants than is a flavonoid 3'-hydroxylase encoded by the nucleotide sequence set forth in SEQ ID NO:26.
2. An isolated nucleic acid molecule according to claim 1 comprising a nucleotide sequence which corresponds to the genetic locus designated *Ht1* or *Ht2* in petunia or to loci in other flowering plant species which contain sequences which control production of 3'-hydroxylated flavonoids.
3. An isolated nucleic acid molecule according to claim 2 comprising a nucleotide sequence or complementary nucleotide sequence substantially as set forth in SEQ ID NO:1 or having at least about 60% similarity thereto or capable of hybridizing to the sequence set forth in SEQ ID NO:1 under low stringency conditions.
4. An isolated nucleic acid molecule according to claim 2 comprising a nucleotide sequence or complementary nucleotide sequence substantially as set forth in SEQ ID NO:3 or having at least about 60% similarity thereto or capable of hybridizing to the sequence set forth in SEQ ID NO:3 under low stringency conditions.
5. An isolated nucleic acid molecule according to claim 2 comprising a nucleotide sequence or complementary nucleotide sequence substantially as set forth in SEQ ID NO:5 or having at least about 60% similarity thereto or capable of hybridizing to the sequence set forth in SEQ ID NO:5 under low stringency conditions.
6. An isolated nucleic acid molecule according to claim 2 comprising a nucleotide sequence or complementary nucleotide sequence substantially as set forth in SEQ ID NO:7

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or having at least about 60% similarity thereto or capable of hybridizing to the sequence set forth in SEQ ID NO:7 under low stringency conditions.

7. An isolated nucleic acid molecule according to claim 2 comprising a nucleotide sequence or complementary nucleotide sequence substantially as set forth in SEQ ID NO:9 or having at least about 60% similarity to the coding region thereof or capable of hybridizing to the sequence set forth in SEQ ID NO:9 under low stringency conditions.
8. An isolated nucleic acid molecule according to claim 2 comprising a nucleotide sequence or complementary nucleotide sequence substantially as set forth in SEQ ID NO:14 or having at least about 60% similarity thereto or capable of hybridizing to the sequence set forth in SEQ ID NO:14 under low stringency conditions.
9. An isolated nucleic acid molecule according to claim 2 comprising a nucleotide sequence or complementary nucleotide sequence substantially as set forth in SEQ ID NO:16 or having at least about 60% similarity thereto or capable of hybridizing to the sequence set forth in SEQ ID NO:16 under low stringency conditions.
10. An isolated nucleic acid molecule according to claim 2 comprising a nucleotide sequence or complementary nucleotide sequence substantially as set forth in SEQ ID NO:18 or having at least about 60% similarity thereto or capable of hybridizing to the sequence set forth in SEQ ID NO:18 under low stringency conditions.
11. An isolated nucleic acid molecule according to claim 2 comprising a nucleotide sequence or complementary nucleotide sequence substantially as set forth in SEQ ID NO:20 or having at least about 60% similarity thereto or capable of hybridizing to the sequence set forth in SEQ ID NO:20 under low stringency conditions.
12. An isolated nucleic acid molecule according to claim 2 comprising a nucleotide sequence or complementary nucleotide sequence substantially as set forth in SEQ ID NO:22

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or having at least about 60% similarity thereto or capable of hybridizing to the sequence set forth in SEQ ID NO:22 under low stringency conditions.

13. An isolated nucleic acid molecule according to claim 2 comprising a nucleotide sequence or complementary nucleotide sequence substantially as set forth in SEQ ID NO:24 or having at least about 60% similarity thereto or capable of hybridizing to the sequence set forth in SEQ ID NO:24 under low stringency conditions.

14. An isolated nucleic acid molecule according to claim 2 comprising a sequence of nucleotides encoding or complementary to a sequence encoding an amino acid sequence substantially as set forth in SEQ ID NO:2 or an amino acid sequence having at least about 50% similarity thereto.

15. An isolated nucleic acid molecule according to claim 2 comprising a sequence of nucleotides encoding or complementary to a sequence encoding an amino acid sequence substantially as set forth in SEQ ID NO:4 or an amino acid sequence having at least about 50% similarity thereto.

16. An isolated nucleic acid molecule according to claim 2 comprising a sequence of nucleotides encoding or complementary to a sequence encoding an amino acid sequence substantially as set forth in SEQ ID NO:6 or an amino acid sequence having at least about 50% similarity thereto.

17. An isolated nucleic acid molecule according to claim 2 comprising a sequence of nucleotides encoding or complementary to a sequence encoding an amino acid sequence substantially as set forth in SEQ ID NO:8 or an amino acid sequence having at least about 50% similarity thereto.

18. An isolated nucleic acid molecule according to claim 2 comprising a sequence of nucleotides encoding or complementary to a sequence encoding an amino acid sequence

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substantially as set forth in SEQ ID NO:10 or SEQ ID NO:11 or SEQ ID NO:12 or SEQ ID NO:13 or an amino acid sequence having at least about 50% similarity thereto.

19. An isolated nucleic acid molecule according to claim 2 comprising a sequence of nucleotides encoding or complementary to a sequence encoding an amino acid sequence substantially as set forth in SEQ ID NO:15 or an amino acid sequence having at least about 50% similarity thereto.

20. An isolated nucleic acid molecule according to claim 2 comprising a sequence of nucleotides encoding or complementary to a sequence encoding an amino acid sequence substantially as set forth in SEQ ID NO:17 or an amino acid sequence having at least about 50% similarity thereto.

21. An isolated nucleic acid molecule according to claim 2 comprising a sequence of nucleotides encoding or complementary to a sequence encoding an amino acid sequence substantially as set forth in SEQ ID NO:19 or an amino acid sequence having at least about 50% similarity thereto.

22. An isolated nucleic acid molecule according to claim 2 comprising a sequence of nucleotides encoding or complementary to a sequence encoding an amino acid sequence substantially as set forth in SEQ ID NO:21 or an amino acid sequence having at least about 50% similarity thereto.

23. An isolated nucleic acid molecule according to claim 2 comprising a sequence of nucleotides encoding or complementary to a sequence encoding an amino acid sequence substantially as set forth in SEQ ID NO:23 or an amino acid sequence having at least about 50% similarity thereto.

24. An isolated nucleic acid molecule according to claim 2 comprising a sequence of nucleotides encoding or complementary to a sequence encoding an amino acid sequence

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substantially as set forth in SEQ ID NO:25 or an amino acid sequence having at least about 50% similarity thereto.

25. An oligonucleotide capable of hybridizing under low stringency conditions to a nucleotide sequence selected from SEQ ID NO:1, 3, 5, 7, 9, 14, 16, 18, 20, 22 and 24.

26. A genetic construct capable of reducing expression of an endogenous gene encoding a flavonoid 3'-hydroxylase in a plant, said genetic construct comprising a nucleotide sequence selected from:

- (i) a nucleotide sequence encoding an amino acid sequence set forth in one of SEQ ID NO:2, 4, 6, 8, 10, 11, 12, 13, 15, 17, 19, 21, 23 or 25 or a complementary form thereof;
- (ii) a nucleotide sequence set forth in one of SEQ ID NO:1, 3, 5, 7, 14, 16, 18, 20, 22 or 24 or the coding region in SEQ ID NO:9 or a complementary form thereof;
- (iii) a nucleotide sequence having at least about 60% similarity to (i) or (ii); and
- (iv) a nucleotide sequence capable of hybridizing under low stringency conditions to (i), (ii) and/or (iii).

27. A method for producing a transgenic plant capable of synthesizing a flavonoid 3'-hydroxylase or a functional derivative thereof, said method comprising stably transforming a cell of a suitable plant with nucleic acid molecule which comprises a sequence of nucleotides encoding said flavonoid 3'-hydroxylase or a derivative thereof under conditions permitting the eventual expression of said nucleic acid molecule, regenerating a transgenic plant from the cell and growing said transgenic plant for a time and under conditions sufficient to permit the expression of the nucleic acid molecule.

28. A method for producing a transgenic plant with reduced endogenous or existing flavonoid 3'-hydroxylase activity, said method comprising stably transforming a cell of a suitable plant with a nucleic acid molecule which comprises a sequence of nucleotides encoding or complementary to a sequence encoding flavonoid 3'-hydroxylase or a derivative thereof, regenerating a transgenic plant from the cell and where necessary growing said

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transgenic plant under conditions sufficient to permit the expression of the nucleic acid molecule.

29. A method according to claim 27 or 28 wherein the introduced nucleic acid molecule comprises a nucleotide sequence or complementary nucleotide sequence selected from:

- (i) a nucleotide sequence encoding an amino acid sequence set forth in one of SEQ ID NO:2, 4, 6, 8, 10, 11, 12, 13, 15, 17, 19, 21, 23 or 25 or a complementary form thereof;
- (ii) a nucleotide sequence set forth in one of SEQ ID NO:1, 3, 5, 7, 14, 16, 18, 20, 22 or 24 or the coding region in SEQ ID NO:9 or a complementary form thereof;
- (iii) a nucleotide sequence having at least about 60% similarity to (i) or (ii); and
- (iv) a nucleotide sequence capable of hybridizing under low stringency conditions to (i), (ii) and/or (iii).

30. A method according to claim 27 or 28 wherein the recipient plant is selected from petunia, carnation, chrysanthemum, rose, snapdragon, tobacco, cornflower, pelargonium, lisianthus, gerbera, apple, iris, lily, African violet and morning glory.

31. A method for producing a transgenic plant capable of modulating hydroxylation of flavonoid compounds, said method comprising stably transforming a cell or group of cells of a suitable plant with a nucleic acid molecule comprising a sequence of nucleotides encoding, or complementary to a sequence encoding, flavonoid 3'-hydroxylase or a derivative thereof, and regenerating a transgenic plant from said cell or cells.

32. A method according to claim 31 where the transformed nucleic acid molecule comprises a nucleotide sequence selected from:

- (i) a nucleotide sequence encoding an amino acid sequence set forth in one of SEQ ID NO:2, 4, 6, 8, 10, 11, 12, 13, 15, 17, 19, 21, 23 or 25 or a complementary form thereof;
- (ii) a nucleotide sequence set forth in one of SEQ ID NO:1, 3, 5, 7, 14, 16, 18, 20, 22 or 24 or the coding region in SEQ ID NO:9 or a complementary form thereof;
- (iii) a nucleotide sequence having at least about 60% similarity to (i) or (ii); and

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(iv) a nucleotide sequence capable of hybridizing under low stringency conditions to (i), (ii) and/or (iii).

33. A transgenic plant having tissue exhibiting altered colour, said transgenic plant comprising a nucleic acid molecule comprising a sequence of nucleotides selected from:

- (i) a nucleotide sequence encoding an amino acid sequence set forth in one of SEQ ID NO:2, 4, 6, 8, 10, 11, 12, 13, 15, 17, 19, 21, 23 or 25 or a complementary form thereof;
- (ii) a nucleotide sequence set forth in one of SEQ ID NO:1, 3, 5, 7, 14, 16, 18, 20, 22 or 24 or the coding region in SEQ ID NO:9 or a complementary form thereof;
- (iii) a nucleotide sequence having at least about 60% similarity to (i) or (ii); and
- (iv) a nucleotide sequence capable of hybridizing under low stringency conditions to (i), (ii) and/or (iii).

34. A cut flower from a transgenic plant according to claim 33.

35. A seed from a transgenic plant according to claim 33.

36. A fruit from a transgenic plant according to claim 33.

37. A leaf from a transgenic plant according to claim 33.

38. Use of a nucleic acid molecule comprising a sequence of nucleotides encoding a flavonoid 3'-hydroxylase in the manufacture of a genetic construct capable of modulating hydroxylation of flavonoid compounds in a plant or cells of a plant.

39. Use according to claim 38 wherein the nucleotide sequence is selected from:

- (i) a nucleotide sequence encoding an amino acid sequence set forth in one of SEQ ID NO:2, 4, 6, 8, 10, 11, 12, 13, 15, 17, 19, 21, 23 or 25 or a complementary form thereof;
- (ii) a nucleotide sequence set forth in one of SEQ ID NO:1, 3, 5, 7, 14, 16, 18, 20, 22 or 24 or the coding region in SEQ ID NO:9 or a complementary form thereof;



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- (iii) a nucleotide sequence having at least about 60% similarity to (i) or (ii); and
- (iv) a nucleotide sequence capable of hybridizing under low stringency conditions to (i), (ii) and/or (iii).